HDR Engineering, Inc.

Regional Charge Alternatives Study

January 3, 2011

CENTRAL MARIN SANITATION AGENCY
REGIONAL CHARGE ALTERNATIVES STUDY

1. INTRODUCTION

The Central Marin Sanitation Agency (CMSA) is evaluating alternatives for allocating the regional charge to its satellite collection agencies, which include the San Rafael Sanitation District (SRSD), Sanitary District No. 1 of Marin County (SD1), and Sanitary District No. 2 of Marin County (SD2).

The regional charge is the means by which CMSA derives revenue for its operating fund. CMSA's Joint Powers Agreement (JPA) authorizes the CMSA governing body, the Board of Commissioners, to set the annual regional charge for wastewater services and allocate the charge between the satellite collection agencies based on the equivalent dwelling unit (EDU) count, wastewater influent volume, or wastewater volume and strength from each collection agency. Each collection agency is then required under the JPA to derive the necessary revenues to pay its share of the regional charge.

Historically, CMSA has allocated the regional charge using the EDU count methodology, which is described in CMSA's Board-adopted Financial Policy #520 - Revenue Management. The purpose of this study is to identify alternative methodologies for determining the regional charge allocation, and to evaluate the advantages and disadvantages of each methodology, from both the CMSA and satellite collection agency perspectives.

2. BACKGROUND

2.1 CMSA Historical Practices

CMSA is a regional wastewater agency that provides wastewater and biosolids treatment and disposal services and other wastewater related services to the residents, businesses, and industries in central Marin County, including San Quentin State Prison (SQP). SRSD, SD1, and SD2 own and operate their respective satellite collection systems, and San Quentin owns and operates its property's collection system. SD1 operates the pump station that pumps San Quentin's wastewater flows into a forcemain, which then conveys the flow to CMSA's wastewater treatment plant. Figure 1 illustrates the influent forcemains that convey wastewater from each collection agency to the wastewater treatment plant.

CMSA continually measures and monitors influent wastewater flow, and has flow meters on the influent forcemains to determine each collection agency's daily influent volumes. The flow/volume information for each flow meter is continuously monitored, recorded and stored by a process control system. As shown in Figure 1, the flow for SD1 is actually calculated as the flow measured at the Ross Valley Interceptor (RVI) flow meter located at the plant, less the flow measured on the SQP and SD2 flow meters.

CMSA also measures the influent flow at the treatment plant headworks for total suspended solids (TSS), biochemical oxygen demand (BOD), ammonia, and other constituents.

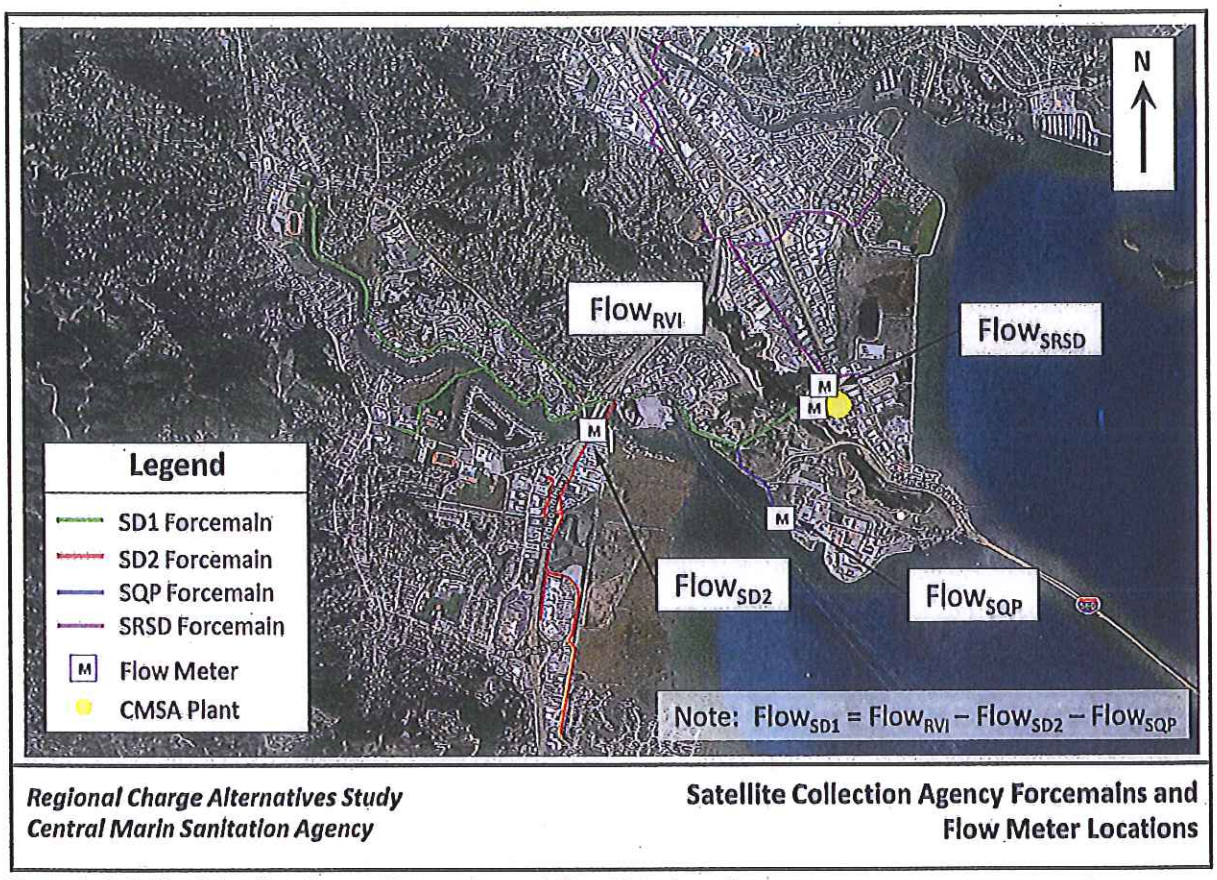

Figure 1. Satellite Collection Agency Forcemains and Flow Meter Locations

CMSA began operations in 1985 and has collected the regional charge from its collection agencies using the EDU count allocation method. The EDU counts are determined by each collection agency, and are reported to CMSA in March of each year. The EDU count information is incorporated into CMSA's annual revenue budget and is used to prepare quarterly invoices. Historically, the collection agencies provided an estimate of the upcoming fiscal year's EDU count and CMSA had used those figures in its budget. In April 2011, the Revenue Management Financial Policy was revised to shift the EDU count used by CMSA from the upcoming fiscal year's estimated count, to the actual count at the time the budget is being developed.

CMSA collects about 90% of its annual operating and capital revenues from the collection agencies. The remaining 10% of Agency revenues come from contract service fees to other agencies, sewer connection fees, septage hauler fees, and other minor sources.

The collection agencies utilize the Proposition 218 process when necessary to increase the wastewater service fees to their customers; these fees are placed on the Marin County property tax rolls and are collected by the County tax collector. Fees for services to government agencies – federal, state, county, cities, towns, and special districts – are collected by direct billings. As a Joint Powers Agency, CMSA is not required to utilize the Proposition 218 process to change its wastewater fees, and intends to continue to collect its regional charge from the collection agencies pursuant to the JPA and the Revenue Management Financial Policy.

2.2 Basic Cost-of-Service Principles

The industry standards typically followed in allocating annual operating and capital costs should reflect the fundamental philosophy of cost-of-service rate-making embodied in the American Water Works Associations (AWWA) *Principles of Water Rates, Fees, and Charges*[1], also referred to as Manual M1. Manual M1 is one of the most widely cited and referenced industry publications on rate studies, and applies to both water and wastewater studies.

The principles presented in Manual M1 have provided the basic framework for this analysis. However, these principles need to be tailored to better fit CMSA's current and historical rate practices and unique characteristics. This tailoring is consistent with Manual M1, which states[2]:

> *"...the costs of water rates and charges should be recovered costs from classes of customers in proportion to the cost of serving those customers. However ... other considerations may be equally or more important in determining rates and charges and may better reflect emerging objectives of the utility or the community it serves."*

From a policy perspective, CMSA's JPA provides the basic understanding between the satellite collection agencies and, therefore, should be considered fair and equitable by these member agencies. In developing the alternative cost-allocation methods discussed below, the over-arching objective reflects basic cost-of-service principles and, ultimately, the fairness and equity among the collection agencies, has been considered and incorporated.

3. REGIONAL CHARGE ALTERNATIVE METHODOLOGIES

Based on a review of the JPA and basic cost-of-service principles, four alternatives were identified for evaluation and comparison to the current EDU-based methodology for developing the regional charge. The current methodology, the Base Case, and the four alternative methodologies are described below.

3.1 Base Case

The Base Case, which is based on the equivalent dwelling units (EDUs) reported by each agency, reflects CMSA's current methodology for calculating the regional charge[3]. The results of this alternative serve as the base case against which the other alternatives can be compared. The following is a summary of the calculation of the percent allocations to each satellite agency:

$$EDU_{Total} = EDU_{SRSD} + EDU_{SD1} + EDU_{SD2} + EDU_{SQP} \quad (1)$$

$$\%\ Allocation_{Agency} = \frac{EDU_{Agency}}{EDU_{Total}} \quad (2)$$

$$Cost\ Allocation_{Agency} = \%\ Allocation_{Agency}\ x\ Cost_{Total} \quad (3)$$

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[1] *Principles of Water Rates, Fees, and Charges*, Manual of Water Supply Practices, M1, AWWA, fifth edition, 2000.

[2] Ibid, pages xix and 79. Also see *Financing and Charges for Wastewater Systems*, Manual of Practice No. 27, Water Environment Federation, 2004, page 91.

[3] The current methodology for calculating the regional charge is slightly different than that described in equations 1 through 3, although it results in the same outcome. It is as follows: Cost $Allocation_{Agency}$ = EDU_{Agency} x Adopted Rate, where Adopted Rate is measured in dollars per EDU.

For this method, the EDU counts for each collection agency are based on those reported to CMSA. CMSA has historically reported the regional charge for each of the three collection agencies as well as SQP. To maintain consistency with that reporting mechanism, SQP has been identified separately in Equation 1 although SD1's current total EDU count includes SQP. For the purposes of this study, CMSA estimated the EDU count separately for SQP and SD1.

3.2 Alternative 1, Flow-Based Allocation

This alternative method would determine the regional charge based on each collection agency's relative influent flows to the wastewater treatment plant. This alternative does not account for differences in strength characteristics (e.g., BOD and TSS).

Flow measurements from existing flow meters on influent forcemains, as shown in Figure 1, are used to quantify each collection agency's influent volumes. Percentage allocations are, therefore, based only on volumetric flow measurements as recorded by CMSA flow meter data. The allocations presented later in this report are calculated based on the average annual influent flow for 2010. Alternatively, the allocations could be based on the total annual influent volume for each agency; the results would be the same. The allocations are determined using the equations below.

$$Flow_{Total} = Flow_{SRSD} + Flow_{SD1} + Flow_{SD2} + Flow_{SQP} \quad (4)$$

$$\%\ Allocation_{Agency} = \frac{Flow_{Agency}}{Flow_{Total}} \quad (5)$$

$$Cost\ Allocation_{Agency} = \%\ Allocation_{Agency}\ x\ Cost_{Total} \quad (6)$$

While flows are directly measured for SRSD, SD2 and SQP, flow data for SD1 is calculated, because, as shown in Figure 1, CMSA does not have a dedicated flow meter to measure the flow contributed by SD1.

3.3 Alternative 2, Three Year Average Flow-Based Allocation

This alternative method is the same as Alternative 1, with the exception that flows would be averaged over the previous three-year period. Like Alternative 1, this alternative does not account for differences in strength characteristics (e.g., BOD and TSS). The allocations for this method are based on the average of total annual influent volume for calendar years 2008, 2009 and 2010, for each collection agency, respectively. Similar to Alternative 1, this allocation method could also be based on the mean average annual flow for three calendar years; the results would be the same.

3.4 Alternative 3, Flow and Strength-Based Allocation

This alternative method is based on both flow and strength data. However, at this time, CMSA does not have sufficient historical strength data for each respective collection agency to complete this analysis[4]. Therefore, hypothetical data was used to illustrate the potential variations in costs among the collection

[4] If this methodology is selected for implementation, CMSA would need to start collecting data in order to document the strength characteristics for each collection agency.

agencies. The hypothetical strength data is based on Monthly NPDES and Process Report Data for fiscal year 2010-2011[5].

Using this method, costs are based on estimates of flow, BOD and TSS loads from each collection agency. For the purposes of this analysis, CMSA's annual costs were allocated to flow, BOD and TSS based on the allocations in Table 2 of Exhibit A of the JPA Agreement[6]:

- Flow – 57.1%
- BOD – 18.0%
- TSS – 24.9%

Using the percentage allocations listed above and flow and influent strength data, unit costs (i.e., $/1,000 gallons of flow, $/lb of BOD and $/lb of TSS) can be estimated. These unit costs are then used to allocate CMSA's costs to each collection agency based on its respective flow, BOD and TSS costs, using the following equations:

$$Cost_{Total} = Cost_{Flow} + Cost_{BOD} + Cost_{TSS} \quad (7)$$

$$Unit\ Cost_{Flow} = \frac{Cost_{Flow}}{Total\ Gallons\ Per\ Year} \quad (8)$$

$$Unit\ Cost_{BOD} = \frac{Cost_{BOD}}{Total\ Pounds\ BOD\ Per\ Year} \quad (9)$$

$$Unit\ Cost_{TSS} = \frac{Cost_{TSS}}{Total\ Pounds\ TSS\ Per\ Year} \quad (10)$$

$$Cost\ Allocation_{Agency} = Unit\ Cost_{Flow} * Flow_{Agency} + Unit\ Cost_{BOD} * BOD_{Agency} + Unit\ Cost_{TSS} * TSS_{Agency} \quad (11)$$

3.5 Alternative 4, Wet Weather Allocation

Storm-related peak flows can be identified as a separate cost component. This alternative allocates only the portion of CMSA's total annual costs that are related to handling (storage, treatment, and disposal) wet weather flows. For the purpose of illustrating the potential variations in costs among the collection agencies, it is estimated that approximately five percent of CMSA's operation and maintenance (O&M) costs, recovered through the regional charge, are attributable to wet weather events[7]. For this alternative, the remaining ninety-five percent of O&M costs could be allocated based on the Base Case or Alternatives 1, 2, or 3.

[5] The average influent TSS was 314 mg/L and the average BOD was 198 mg/L. These values were used as the basis for developing strength values, which were then assigned at random to the collection agencies.

[6] If this methodology is selected for implementation, CMSA may want to consider undertaking a more detailed analysis to confirm the appropriate allocation of these costs.

[7] If this methodology is selected for implementation, CMSA would need to undertake a more detailed analysis to confirm the costs associated with wet weather events.

Peak flows attributed to each collection agency based on CMSA flow meter data can be used to determine their respective percentage of these wet weather related costs. That is, the amount that each collection agency contributes to the wet weather inflows can be used to allocate wet weather related costs.

For each collection agency, the peak flows, as a percent of the total peak flow, are the average of three storm events[8]. The percentage for each agency was then used to allocate CMSA's wet weather-related costs to each agency, as follows:

$$PF_{Total} = PF_{SRSD} + PF_{SD1} + PF_{SD2} + PF_{SQP} \quad (12)$$

PF = Peak Flow as measured by CMSA flow meters.

$$\%\ Allocation_{\ Agency} = \frac{PF_{Agency}}{PF_{Total}} \quad (13)$$

$$PF\ Cost_{Total} = 5\%\ x\ Cost_{Total} \quad (14)$$

$$Cost\ Allocation_{Agency} = \%\ Allocation_{\ Agency}\ x\ PF\ Cost_{Total} \quad (15)$$

While the equations above indicate that peak flows are used as the basis for this alternative, there are other ways to allocate wet weather related costs, including volume.

4. BUDGET ALLOCATION FOR EACH ALTERNATIVE

Each of the alternatives described in the previous section were evaluated using CMSA data and the assumptions described above. The results of the analyses are summarized in Table 1; for each alternative it was assumed that the total regional charge is $9,032,809. ***It is important to note that the results shown for Alternative 3 are based on hypothetical strength data and are included as an example only.***

Table 1. Summary of Alternative Regional Charge Methodologies

Alternative	Unit	SRSD	SD2	SD1	SQP	Total
Base Case, FY12[a]	%	35%	11%	41%	13%	100%
	$	$3,194,181	$983,724	$3,668,015	$1,186,890	$9,032,809
Base Case, FY13[b]	%	38%	12%	44%	6%	100%
	$	$3,458,361	$1,065,085	$3,971,384	$537,979	$9,032,809
Alternative 1	%	37%	10%	48%	5%	100%
	$	$3,349,749	$875,174	$4,355,770	$452,116	$9,032,809
Alternative 2	%	36%	10%	49%	5%	100%
	$	$3,253,198	$907,745	$4,457,832	$414,034	$9,032,809
Alternative 3[c]	%	38%	11%	46%	5%	100%
	$	$3,441,221	$986,348	$4,141,665	$463,574	$9,032,809
Alternative 4	%	37%	10%	48%	5%	100%
	$	$3,374,116	$874,197	$4,347,228	$437,268	$9,032,809

a. Results are based on SQP having 7,209 EDUs, per the adopted budget in fiscal year 2012.
b. Results are based on SQP having 3,018 EDUs, per the new EDU estimate reported by SD1.
c. Strength data is not currently available for the collection agencies. Thus, the values reported are examples only.

[8] The maximum peak flows measured at CMSA's flow meters for separate storm events in 2007, 2009 and 2010 provided by CMSA staff were used for this analysis.

As illustrated in Table 1, there are measurable differences in the resulting regional charge for each of the alternatives. The most pronounced differences are for SD1 and SQP, when comparing the FY12 Base Case to other alternatives.

Table 2 summarizes the advantages and disadvantages of each alternative. The following subsections further describe the results and the advantages and disadvantages for each alternative. Appendix A includes additional details of the calculations and assumptions for each alternative.

Table 2. Summary of Alternative Advantages and Disadvantages

Alternative	Advantages	Disadvantages
Base Case	▲ Historical Precedence ▲ Simple and Well-Accepted	▲ May Not be the Most Equitable ▲ Member Agency EDUs Estimates are not Easily Verifiable
Alternative 1	▲ Objective and Verifiable. ▲ Simple and Well-Accepted ▲ Provides Incentive to Minimize Flow	▲ Requires a Change from the Current Methodology ▲ Potential Instability of Allocations Year-to-Year
Alternative 2	▲ Objective and Verifiable ▲ More Year-to-Year Stability than Alternative 1 ▲ Provides Incentive to Minimize Flow	▲ Requires a Change from the Current Methodology
Alternative 3	▲ Objective and Verifiable ▲ Incorporates Strength-related Cost Allocations, Enhancing Equity of Allocation ▲ More Consistent with Cost-of-Service Principles ▲ Provides Incentive to Minimize Flow	▲ Requires a Change from the Current Methodology ▲ Requires Additional Monitoring, and Data Collection and Analysis ▲ More Complicated
Alternative 4	▲ May Encourage Member Agencies to Reduce Storm-Related Inflow and Infiltration ▲ Provides an Additional Measure of Equity Related to Handling Storm-Related Flows ▲ Provides Incentive to Reduce Peak Flows and/or Volumes	▲ Requires a Change from the Current Methodology ▲ Provides Insignificant Changes to Overall Cost Allocations ▲ Requires Additional Data Analysis and Calculations ▲ More Complicated

4.1 Base Case

As previously described, the Base Case is based on CMSA's current methodology for calculating the regional charge. Two versions of the Base Case were evaluated because SD1 has reported that the SQP EDUs will be reduced beginning in fiscal year 2012 and future years. Thus, both the current allocation (FY12) and the future FY13 allocation were included to illustrate the relative differences. While the regional charge allocated for SQP will be lower with the decrease in its EDU count, the allocation for the other collection agencies would increase.

The advantages of the Base Case are that the data necessary to complete the allocation are provided by each collection agency and the EDU method implicitly includes both a strength and flow factors.

The method of determining EDUs may not be the same for each collection agency, which could create an inequality between the customers in one collection system versus another. Currently, the determination of an EDU for residential customers is consistent among the collection agencies; however, the method for other customer classes may not be the same.

4.2 Alternative 1, Flow Based Allocation

With Alternative 1, the regional charge would be based on average annual influent flows or volumes for each collection agency for the previous calendar year. As shown in Table 1, the method would result in an increase in the regional charge for both SRSD and SD1 compared to the FY12 Base Case, and a decrease for SD2 and SQP. When comparing the results to the FY13 Base Case, only SD1 increases; the other collection agencies' allocations would decrease.

While this method allocates costs based on flow, it does not consider the strength of the influent flows which may not be as equitable because CMSA's annual treatment costs are linked to the strength of influent received at the plant; differences in strength between collection agencies would not be considered. In addition, using data from only one year as the basis for the allocation could result in some instability from year-to-year due to the variability of storm events. Figure 2 illustrates the year to year variability in both the annual flow volume and resulting allocations for each satellite collection agency since FY07/08. Based on the information presented in Figure 2, the allocation for SD2 would have been consistent at about 10%. SRSD and SD1 (including SQP) would have some variability; the allocation varies by approximately 3% for each agency based on data for the four year period[9].

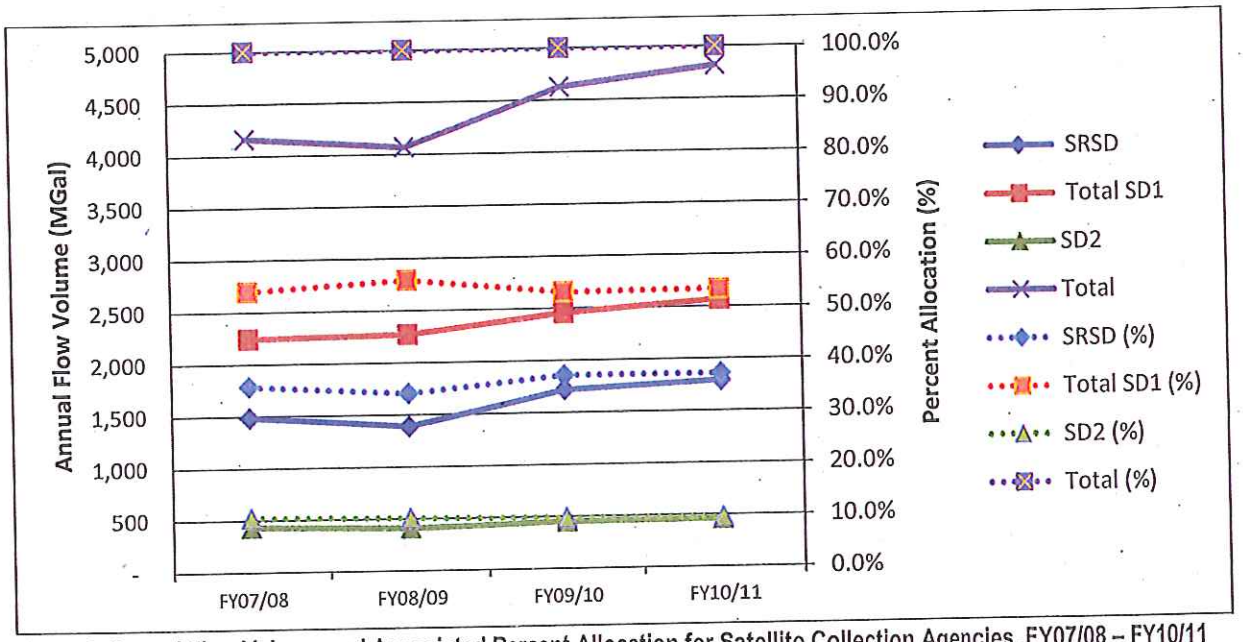

Figure 2. Annual Flow Volume and Associated Percent Allocation for Satellite Collection Agencies, FY07/08 – FY10/11

4.3 Alternative 2, 3 Year Average Flow-Based Allocation

As shown in Table 1, similar to Alternative 1 this alternative would also result in an increase for SRSD and SD1 when compared to the FY12 Base Case and a decrease for SD2 and SQP. When comparing Alternative 2 to the FY13 Base Case, only SD1 would see an increase in its allocation, while the other collection agencies would see a decrease.

[9] Due to the availability and format of historical data, flows for SQP were included with SD1 for the purposes of developing Figure 2. For the same reason, fiscal years were also used in this example, rather than calendar years.

Similar to Alternative 1, this allocation method is based solely on historical flow data. However, it would improve upon the variability of wet weather flows from one agency to another from year to year by using a rolling three year average as the basis for the allocation. Figure 3 illustrates the relative stability in the percent allocation using this alternative, with allocations being within 1% from one period to the next.

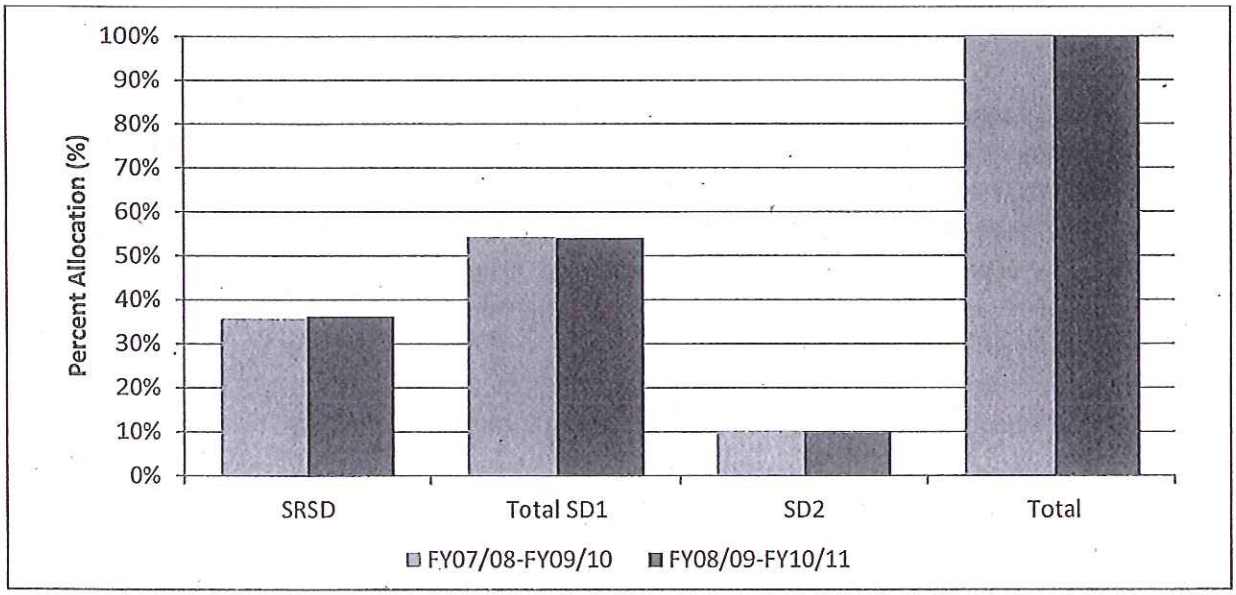

Figure 3. Percent Allocation for Satellite Collection Agencies based on Rolling 3-Year Average[10]

Unlike Alternative 1, if a particular collection agency had instituted a large capital improvement project to reduce inflow and infiltration in its collection system, this method would require two to three years for that agency to realize a reduction in its percent allocation of the regional charge.

4.4 Alternative 3, Flow and Strength-Based Allocation

As previously described, CMSA does not currently collect strength data for each of the individual collection agencies. Therefore, the results presented in Table 1 are based on hypothetical strength data and are included as an example only and should not be compared to the other alternatives. It should be noted that while the flow data included in this analysis was based on only one calendar year, similar to Alternative 2, the flow component could be developed using, for example, a three year average to smooth year to year variations.

The key advantage of this alternative is that it considers both flow and strength data in the allocation of costs, which is consistent with cost of service principles.

The key disadvantage associated with this alternative is that CMSA currently does not collect the data necessary to support it. Thus, additional strength monitoring would be required.

[10] Due to the availability and format of historical data, flows for SQP were included with SD1 for the purposes of developing Figure 3. For the same reason, fiscal years were also used in this example, rather than calendar years.

4.5 Alternative 4, Wet Weather Allocation

The wet weather allocation should only be applied to the portion of costs associated with wet weather events (e.g., overtime, additional chemicals and power, etc.). CMSA estimates that wet weather costs make up approximately five percent of the costs recovered through the regional charge. This method could be combined with the Base Case or with Alternatives 1, 2, or 3, which would be used to allocate the remaining ninety-five percent of the costs recovered by the regional charge.

The results included in Table 1 are based on a combination with Alternative 1, flow-based allocation. As shown, the results are nearly the same between Alternative 1 and Alternative 4 (less than 0.5% difference), illustrating that the wet weather cost component is very minor compared to the total costs included in the regional charge (refer to Appendix A for additional details).

The results presented in Table 1 were developed using data from three storm events in 2007, 2009 and 2010, respectively. An alternative approach would be to use multiple storms during only one calendar year.

As part of the evaluation of this alternative, both coincident and non-coincident storm-related peak flows were considered. That is, the peak flows of each of the collection agencies was determined using (1) their respective flows during the maximum influent flow as measured at the wastewater treatment plant, and (2) their individual maximum peak flows whether or not they occurred during the maximum plant influent event (i.e., the non-coincident peaks). This second approach resulted in total flows that were greater than the flow for the maximum coincident peak. However, there was an insignificant difference in the costs allocated to each satellite agency using these two methods[11].

One benefit of this alternative is that, while the impact of this method is small, it could serve as an incentive for agencies with large wet weather contributions to reduce wet weather related infiltration and inflow. One disadvantage to this alternative is that the variability in intensity and duration across the collection agency service areas could mean that a large storm event in one collection agency's service area could have a relatively insignificant impact on another agency's collection system. This variability could result in some variability in the annual allocation of the regional charge. Another disadvantage is that this alternative would create an additional administrative and data analysis effort by CMSA staff and, based on these results, would have only a minimal impact on the total costs allocated to individual satellite collection agencies.

5. SUMMARY

The purpose of this study was to identify alternative methodologies for determining the respective allocation of CMSA's regional charge to its satellite collection agencies, and to evaluate the advantages and disadvantages of each methodology, as well as the potential impacts of each methodology when compared to the Base Case.

The Base Case relies on the number of EDUs reported by each collection agency, and includes FY12 and FY13 versions; the FY13 version has a revised, lower EDU estimate for SQP, and reduces SQP's

[11] Because of this, only the Alternative 4 results of the coincident peak approach are shown in Table 1.

allocated costs by about half compared to the FY12 version. The four alternative allocation methodologies were developed to reflect basic cost-of-service principles and to provide fairness and equity among the satellite collection agencies.

Table 1 previously summarized the potential impacts of each alternative, which vary from agency to agency. Using the FY13 version of the Base Case for comparison purposes, the following is a summary of the results:

- SRSD and SD2 have up to 2% lower percent allocations as compared to the FY13 Base Case.
- SQP drops from the FY13 Base Case of 6% to 5% in each of the alternatives.
- SD1 has an increase in the percent allocation, increasing by 5% in Alternative 2 and by 4% in Alternatives 1 and 4.

The results for Alternative 3 are based on hypothetical strength data and should be considered as an example only.

The advantages and disadvantages for each alternative, which are summarized in Table 2, indicate Alternatives 1 through 3 provide more objective and verifiable cost allocations, although Alternative 3 would require additional data collection and analysis. Although Alternative 4 offers some additional equity related to storm-related system costs, this preliminary analysis indicates there would be insignificant differences in total cost allocations to individual collection agencies.

Based on the alternative CMSA chooses to use in the future, additional data collection and analysis may be required. For example, in order to implement Alternative 3, CMSA would need to determine the BOD and TSS loads contributed by each collection agency and consider a refinement of the allocation of Agency costs between flow, BOD and TSS. Finally, if CMSA desired to implement Alternative 4, the Agency costs attributed to wet weather events should be evaluated in more detail.

Appendix A

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Base Case

		Notes	SRSD	SD#2	SD#1	SQP	Total
Reported EDUs	EDU	a	19,401	5,975	22,279	7,209	54,864
% Allocation	%	b	35.4%	10.9%	40.6%	13.1%	100.0%
Cost Allocation	$		$3,194,181	$983,724	$3,668,015	$1,186,890	$9,032,809
Future EDUs	EDU	c	19,401	5,975	22,279	3,018	50,673
% Allocation	%	b	38.3%	11.8%	44.0%	6.0%	100.0%
Cost Allocation	$		$3,458,361	$1,065,085	$3,971,384	$537,979	$9,032,809

Notes:

a Based on FY 2011-12 Member Agencies EDUs; SQP EDUs estimated by CMSA.

b Calculated as a percentage of the Total Reported EDUs.

c SD1 has indicated that SQP EDUs will be reduced in future years from 7,209 to 3,018.

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Alternative 1, Flow-Based Allocation

		Notes	SRSD	SD#2	SD#1	SQP	Total
Average Annual Inflow							
Contributing Flow	mgd	a	5.02	1.31	6.53	0.68	13.54
% Allocation	%	b	37.1%	9.7%	48.2%	5.0%	100.0%
Cost Allocation	$	c	$3,349,749	$875,174	$4,355,770	$452,116	$9,032,809

		Notes	SRSD	SD#2	SD#1	SQP	Total
Total Annual Inflow							
Contributing Flow	Mgal	d	1,833	479	2,384	247	4,943
% Allocation	%	b	37.1%	9.7%	48.2%	5.0%	100.0%
Cost Allocation	$	c	$3,349,749	$875,174	$4,355,770	$452,116	$9,032,809

Notes:

a Based on average annual influent flow for calendar year 2010.
b Calculated as a percentage of the Total Contributing Flow.
c Cost is based on total regional sewer service charge for FY 2010-11.
d Based on total annual influent flow for calendar year 2010.

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Alternative 2, 3-Year Average Flow Based Allocation

		Notes	SRSD	SD#2	SD#1	SQP	Total
2008 Flow	Mgal	a	1,440	429	2,110	118	4,097
2009 Flow	Mgal	b	1,464	414	1,998	238	4,113
2010 Flow	Mgal	c	1,833	479	2,384	247	4,943
3-Year Average Flow	Mgal	d	1,579	441	2,164	201	4,384
% Allocation	%	e	36.0%	10.0%	49.4%	4.6%	100.0%
Cost Allocation	$	f	$3,253,198	$907,745	$4,457,832	$414,034	$9,032,809

Notes:

a Total annual influent flow for calendar year 2008, per the Monthly NPDES and Process Report data.
b Total annual influent flow for calendar year 2009, per the Monthly NPDES and Process Report data.
c Total annual influent flow for calendar year 2010, per the Monthly NPDES and Process Report data.
d Calculated as the average of 2008, 2009, and 2010.
e Calculated as a percentage of the total 3-Year Average Flow.
f Cost is based on total regional sewer service charge for 2010-11.

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Alternative 3, Flow and Strength Based Allocation

Development of Unit Costs

		Notes	Flow	TSS	BOD	Total
Allocation of Costs	%	a	57.1%	18.0%	24.9%	100%
Cost Components	$	b	$5,157,734	$1,625,906	$2,249,169	$9,032,809
Quantity	(Mgal or Pounds)	c	4,943	11,283,066	7,318,708	
Unit Cost	($/1,000gal or $/lb)	d	$1.04	$0.14	$0.31	

Allocation of Costs

			SRSD	SD#2	SD#1	SQP	Total
Contributing Flow	Mgal	e	1,833	479	2,384	247	4,943
Flow-Based Cost	$	f	$1,912,707	$499,725	$2,487,145	$258,158	$5,157,734
EXAMPLE TSS Concentration	mg/L	g	303	376	251	314	
Contributing TSS	lb	h	4,514,838	1,437,361	4,887,026	606,746	11,445,971
TSS-Based Cost	$	f	$650,594	$207,126	$704,227	$87,433	$1,649,380
EXAMPLE BOD Concentration	mg/L	i	192	238	159	198	
Contributing BOD	lb	h	2,856,718	909,475	3,092,216	383,912	7,242,322
BOD-Based Cost	$	f	$877,920	$279,498	$950,293	$117,983	$2,225,695
Total Cost Allocation	$	j	$3,441,221	$986,348	$4,141,665	$463,574	$9,032,809
Percent Allocation	%	k	38.1%	10.9%	45.9%	5.1%	100%

Notes:

a Allocation of costs based on Table 2, Appendix A of the JPA Agreement.
b Cost is based on total regional sewer service charge for 2010-11.
c Total annual influent flow for calendar year 2010, per the Monthly NPDES and Process Report data.
d Calculated as the cost of the respective component divided by the quantity.
e Total annual influent flow for calendar year 2010, per the Monthly NPDES and Process Report data.
f Calculated as the total quantity contributed by each agency times the unit cost
g Concentration values are EXAMPLES ONLY. For reference, CMSA's average influent TSS was 314 during FY10/11.
h Calculated based on EXAMPLE concentration data and Contributing Flow.
i Concentration values are EXAMPLES ONLY. For reference, CMSA's average influent BOD was 198 during FY10/11.
j Calculated as sum of Flow-, TSS, and BOD-based costs.
k Calculated as total cost for each agency divided by total CMSA cost.

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Alternative 4, Wet Weather Allocation with Coincident Peak Flows

Wet Weather Cost Component

		Notes	SRSD	SD#2	SD#1	SQP	Total
Storm 1 - Peak Flow	MGD	a	32.47	5.97	21.12	2.15	61.71
Storm 1 Contribution	%	b	53%	10%	34%	3%	
Storm 2 - Peak Flow	MGD	c	31.15	8.04	40.92	-	80.11
Storm 2 Contribution		b	39%	10%	51%	0%	
Storm 3 - Peak Flow	MGD	d	37.07	8.99	55.35	1.72	103.13
Storm 3 Contribution		b	36%	9%	54%	2%	
Average Contribution	%	e	42%	9%	46%	2%	
Wet Weather Cost	$	f	$191,854	$42,782	$209,246	$7,758	$451,640
Non-Wet Weather Cost Component							
Contributing Flow	mgd	g	5.02	1.31	6.53	0.68	13.54
% Allocation	%	g	37%	10%	48%	5%	100%
Non-Wet Weather Cost	$	h	$3,182,261	$831,416	$4,137,982	$429,510	$8,581,169
Total Cost Allocation	$	i	$3,374,116	$874,197	$4,347,228	$437,268	$9,032,809
Percent Allocation	%	j	37.4%	9.7%	48.1%	4.8%	100%

Notes:

a Based on flow measurement during maximum instantaneous flow during the December 18, 2007 storm event.
b Calculated as the flow of the agency divided by the total flow.
c Based on flow measurement during maximum instantaneous flow during the February 16, 2009 storm event.
d Based on flow measurement during maximum instantaneous flow during the January 20, 2010 storm event.
e Calculated as the average of percent contributions during the three storms.
f Total Wet Weather Cost is based on 5% of the total regional sewer service charge for 2010-11.
g See Alternative 1, Flow Based Allocation. Alternatives 2, 3 or the Base Case could also be used to allocate the remaining costs.
h Total Non-Wet Weather Cost is based on 95% of the total regional sewer service charge for 2010-11.
i Calculated as the sum of the Wet Weather Cost plus the Non-Wet Weather Cost.
j Calculated as total cost for each agency divided by total CMSA cost.

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Alternative 4B, Wet Weather Allocation with Non-Coincident Peak Flows

Wet Weather Cost Component

		Notes	SRSD	SD#2	SD#1	SQP	Total
Storm 1 - Peak Flow	MGD	a	35.11	7.03	29.30	2.45	73.89
Storm 1 Contribution	%	b	48%	10%	40%	3%	
Storm 2 - Peak Flow	MGD	c	34.30	8.19	44.42	2.21	89.11
Storm 2 Contribution		b	38%	9%	50%	2%	
Storm 3 - Peak Flow	MGD	d	41.49	11.19	55.35	3.32	111.35
Storm 3 Contribution		b	37%	10%	50%	3%	
Average Contribution	%	e	41%	10%	46%	3%	
Wet Weather Cost	$	f	$185,568	$43,273	$209,582	$13,218	$451,640
Non-Wet Weather Cost Component							
Contributing Flow	mgd	g	5.02	1.31	6.53	0.68	13.54
% Allocation	%	g	37%	10%	48%	5%	100%
Non-Wet Weather Cost	$	h	$3,182,261	$831,416	$4,137,982	$429,510	$8,581,169
Total Cost Allocation	$	i	$3,367,830	$874,688	$4,347,563	$442,728	$9,032,809
Percent Allocation	%	j	37.3%	9.7%	48.1%	4.9%	100%

Notes:

a Based on flow measurement during maximum instantaneous flow during the December 18, 2007 storm event.
b Calculated as the flow of the agency divided by the total flow.
c Based on flow measurement during maximum instantaneous flow during the February 16, 2009 storm event.
d Based on flow measurement during maximum instantaneous flow during the January 20, 2010 storm event.
e Calculated as the average of percent contributions during the three storms.
f Total Wet Weather Cost is based on 5% of the total regional sewer service charge for 2010-11.
g See Alternative 1, Flow Based Allocation. Alternatives 2, 3 or the Base Case could also be used to allocate the remaining costs.
h Total Non-Wet Weather Cost is based on 95% of the total regional sewer service charge for 2010-11.
i Calculated as the sum of the Wet Weather Cost plus the Non-Wet Weather Cost.
j Calculated as total cost for each agency divided by total CMSA cost.